Good Science and Bad Science

An Owners Perspective on The Proposed Twin Cessna Spar AD

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Why I am here, and interested in this issue?

“If you are looking for perfect safety, you will do well to sit on a fence and watch the birds; but if you really wish to learn, you must mount a machine and become acquainted with its tricks by actual trial.”

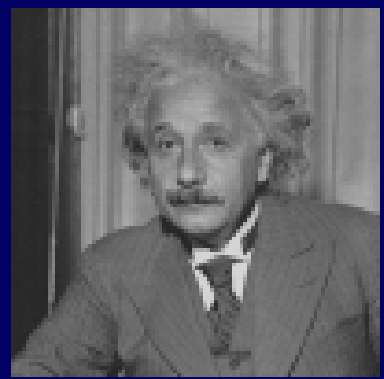
Wilbur Wright, from an address to the Western Society of Engineers in Chicago, 18 September 1901

THE FAA's GOAL OF SAFETY AND PRO-ACTIVE INITIATIVES IS COMMENDABLE

- Neither of us want my airplane to lose a wing
- Neither of us want dangerous airplanes crashing:
  - Causing loss of life and property
  - Providing fodder for endless lawsuits
  - Earning public animosity
  - Giving general aviation a bad reputation
  - Raising insurance rates, etc., etc, etc……
- Neither Cessna, the FAA or I want to await fatal accidents before undertaking safety initiatives

“The significant problems we have cannot be solved at the same level of thinking with which we created them.”

Albert Einstein



THIS NPRM IS A HISTORIC PRECEDENT SETTING PARADIGM SHIFT

BEFORE

AD's were promulgated based on accidents and service difficulty reports (Remedial Action)

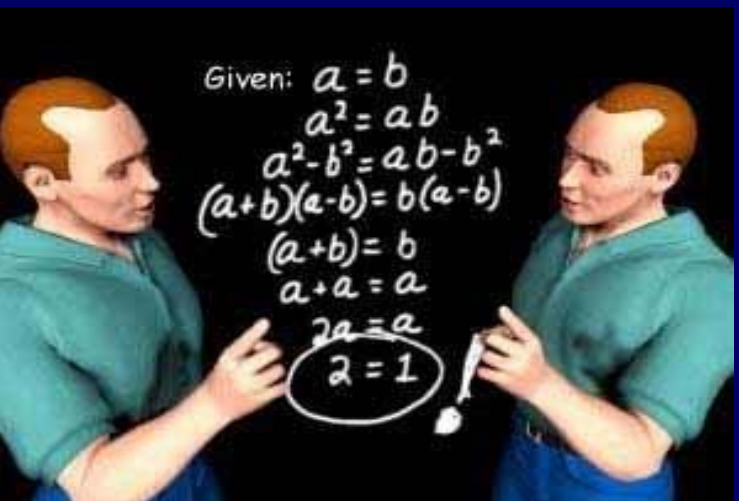
NOW

The FAA has commissioned a study and is proposing an AD to pro-actively head off potential safety issues (Preventative Action)

BUT LET'S NOT LOSE PERSPECTIVE

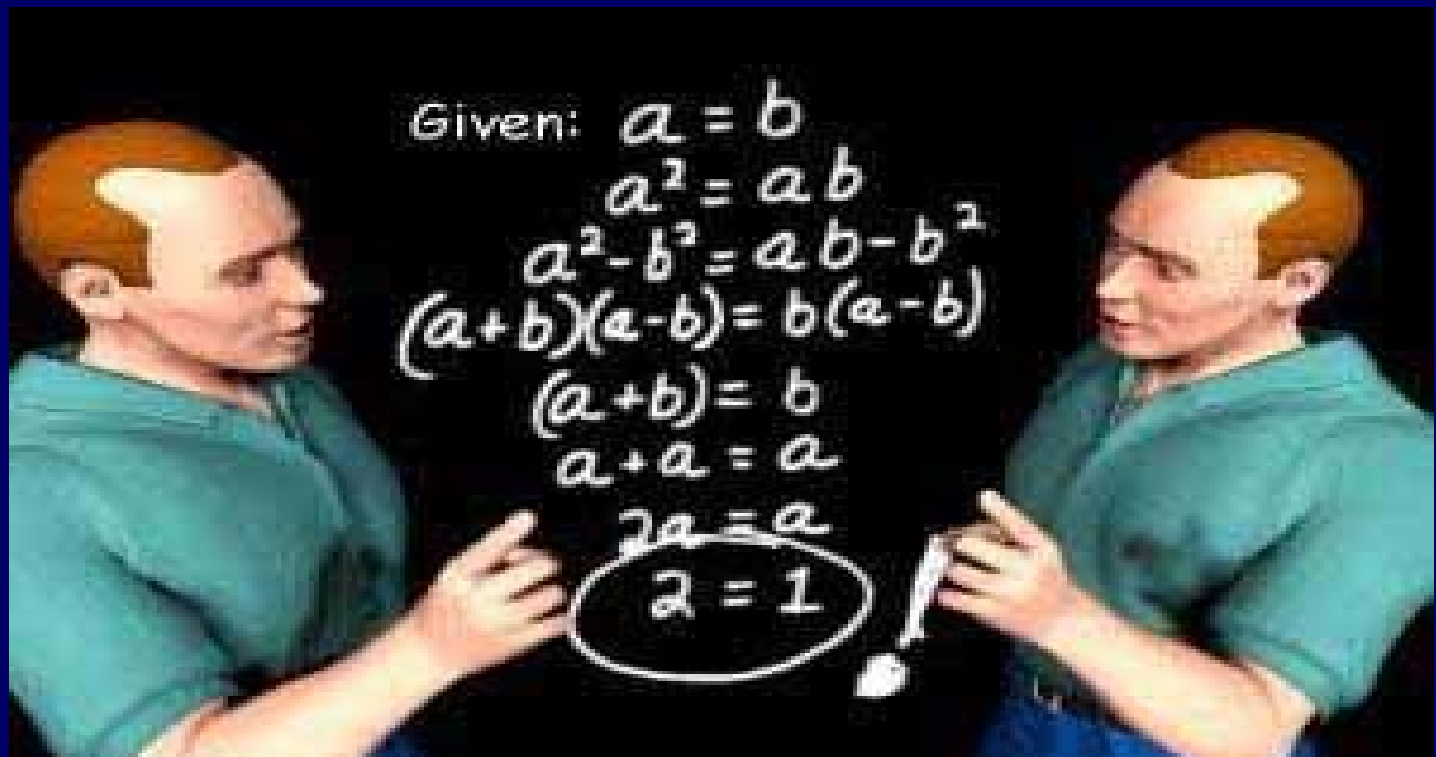
As a famous scientist once said;

"Smart people (like smart lawyers) can come up with very good explanations for mistaken points of view."



CORRECT PRINCIPLES INCORRECTLY (OR INCOMPLETELY) APPLIED CAN RESULT IN INCORRECT CONCLUSIONS

(FUZZY THINKING)



STEPS: SCIENTIFIC METHOD

- 1. A Question or Problem is identified.
- 2. A Hypothesis or Working Assumption is formulated relative to the question.
- 3. Experimental Tests of the hypothesis by several independent experimenters are carried out and observations made.
- 4. If the experiments bear out the hypothesis it may then be said to be Predictive and becomes a Theory.

REPEATABILITY

"A Theory is accepted not based on the *prestige or convincing powers of the proponent*, but on the results obtained through observations and/or experiments which *anyone* can reproduce."

REPEATABILITY

- STUDY RESULTS MUST BE INDEPENDENTLY REPEATABLE

INDEPENDANT VERIFICATION

"Most experiments and observations *are* repeated many times by *independent investigators*. If the original claims are not verified, the origin of such discrepancies is hunted down and exhaustively studied."

INDEPENDANT VERFIFICATION

- STUDY RESULTS MUST BE INDEPENDANTLY VERIFIABLE

BENEFITS: PREDICTIVE VALUE

- IF A THEORY IS DEVELOPED THROUGH PROPER APPLICATION OF THE SCIENTIFIC METHOD THEN IT BECOMES A CONCEPTUAL FRAMEWORK THAT EXPLAINS EXISTING OBSERVATIONS and PREDICTS NEW ONES

IF THE THOERY DOESN'T CORRECTLY PREDICT WHAT IS SEEN IN THE FIELD THEN THE EXPERIMENTAL MODEL (THEORY) IS NOT VALID AND MUST BE MODIFIED AND RETESTED !

TODAYS SITUATION:

- BECAUSE THIS AD WILL SET A PRECEDENT FOR ALL FUTURE PREVENTATIVE ACTION ADs ....

WE DARN WELL BETTER GET THIS RIGHT ! ! !

THE SCIENCE PROBLEM

- The Proposed AD was arrived at by skipping multiple steps in the Scientific Method
  - Not independently verified
  - Not independently replicated
  - To date it doesn't appear to be consistent with field experience
  - Based on proprietary data that can't be independently reviewed

SCIENCE VS. ENGINEERING

"THIS IS NOT SCIENCE. IT IS ENGINEERING, WE MAKE OUR BEST GUESS AND MOVE ON".

Bob Eastin, FAA Chief Scientific Technical Advisor

“BUT THIS ISN’T SCIENCE”

- The FAA and Cessna’s case is detailed and compelling. It suggests to me:
  - That it isn’t unusual that we haven’t seen cracks in 402C aircraft even at high times
  - That there is a remote but finite possibility that cracks will occur even at relatively low times (5,500 hrs)
  - That cracks can propagate destructively prior to being detected by any currently available NDI technique
  - Independent validation of the Cessna study has been done by the FAA, Australian & British counterparts
- The FAA analysis suggests, but isn’t definitive in making the case, that we can’t wait for properly applied scientific confirmation

PROBLEMS THE NPRM HASN'T ADDRESSED

- Not enough capable facilities to competently perform this AD on the large numbers of affected aircraft
- The un-expected discovery of collateral damage to the spar cap in 40% of modified aircraft (Is another AD needed to address this issue?)
- The need for FAA/Cessna oversight of repair facilities during the "learning curve"
- The need for ongoing quality control of the modifications being performed

THE NPRM SERIOUSLY UNDER ESTIMATES THE COSTS TO COMPLY

- Doesn't reflect loss of aircraft value due to pending AD action
- Doesn't reflect real life labor costs including amortizing ramp up costs
- Doesn't reflect loss of use of the aircraft for months at a time while the AD is complied with
- Doesn't reflect ongoing insurance, hangar, tax, debt service and depreciation costs during prolonged down times
- Doesn't reflect the cost to ferry the aircraft to and from one of the few shops that can/will perform this complex AD
- Doesn't reflect costs for alternative transportation during prolonged down time

THE GOOD NEWS

- NOT A SINGLE TWIN CESSNA HAS FALLEN FROM THE SKY DUE TO THE METAL FATIGUE PREDICTED BY CESSNA
- HUNDREDS OF AIRCRAFT WITH EXTREMLY HIGH TOTAL TIMES ARE FLYING WITHOUT EVIDENCE OF METAL FATIGUE

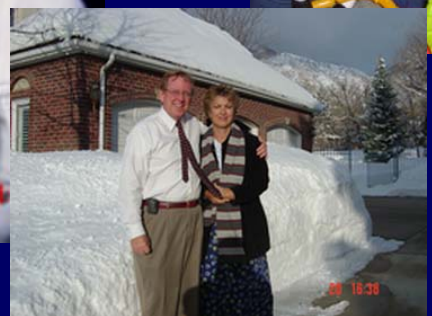
MORE GOOD NEWS

- THE CAPE AIR EXPERIENCE (ongoing)
- THE YINGLING AVIATION EXPERIENCE
- THE NIAR LABORATORY EXPERIENCE

ALL SEEM TO BE SHOWING THAT HIGH TIME AIRCRAFT THAT HAVE BEEN EXPOSED TO LOW LEVEL (turbulent) SHORT HAUL (lots of landing stresses) FLIGHTS ARE NOT MANIFESTING EVIDENCE OF METAL FATIGUE AS PREDICTED BY THE CESSNA STUDY

I WANT THE SAFETY OF MY FAMILY RESTING ON MORE THAN JUST ENGINEERING ANALYSIS.

I WANT TO KNOW THE TRUTH OF THIS MATTER. ULTIMATELY ONLY GOOD SCIENCE, PROPERLY CONFIRMED, WILL YIELD THAT TRUTH!



SUMMARY

- SINCE THE PROPOSED AD IS A PROPHYLATIC (PREVENTATIVE) MEASURE THERE IS NO NEED FOR A RUSH TO JUDGEMENT
- IN MEDICINE WE SAY: "PRIMUM NON NOCERE" Roman physician, Galen.
- “ABOVE ALL ELSE, FIRST DO NO HARM”

SUMMARY

- PROPHYLACTIC MEASURES MUST MEET A HIGHER STANDARD THAN REMEDIAL MEASURES BECAUSE:
  - THE PROPHYLAXSIS MAY CAUSE SECONDARY, UNFORSEEN, POSSIBLY DAMAGING CONSEQUENCES
  - THIS FIX (WHILE THEORETICALLY SOUND) HAS NO PROVEN TRACK RECORD
  - THIS FIX HAS A HIGH POTENTIAL TO BE DONE INCORRECTLY

I HAVE CONCLUDED:

- THE CASE FOR PERFORMING THE SPAR STRAP MODIFICATION IS COMPELLING
- THE MOST SERIOUS UN-ANSWERED QUESTIONS REGARD:
  - TIMING OF IMPLEMENTATION
  - OVERSIGHT OF RAMP UP EXPERIENCE
  - QUALITY CONTROL OF MODIFICATIONS
- BYPASSING THE SAFETY NET INSURED BY CAREFUL APPLICATION OF THE SCIENTIFIC METHOD ON A MATTER OF SUCH IMPORTANCE IS TROUBELING

RECOMMENDATIONS

I URGE THE FAA TO CONSIDER THE FOLLOWING IN THE WRITTING OF THIS AD:

- WORK WITH OWNERS/OPERATORS/CAPE AIR/CPA/ETC., ETC TO:

  DEVELOPE REALISTIC IMPLEMENTATION PARAMETERS (AC Type & Airframe Times) TO PHASE IN COMPLIANCE SO MUCH OF THE FLEET WON'T BE GROUNDED

- REALISTICALLY ASSESS THE INFRASTRUCTURE NEEDED TO COMPLY

RECOMMENDATIONS cont.

- DEVELOPE GUIDELINES FOR OVERSIGHT OF TRAINING OF THOSE WHO WILL DO THE MODIFICATIONS
- DEVELOPE METHODS TO IMPLEMENT QUALITY CONTROL OF MODIFICATIONS
- CONTINUE TO STUDY THIS ISSUE:
  - Actively seek independent scientific verification (PRO or CON) of the need for the AD
  - Refine and re-test the Theory to verify that it concurs with what is seen in the field
  - Seek new methodologies to evaluate the risks of fatigue failure

“In flying I have learned that carelessness and overconfidence are usually far more dangerous than deliberately accepted risks.”

Wilbur Wright in a letter to his father September, 1900.